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BOOK REVIEWS

Nuclear Methods in Science and Technology
(Fundamental and Applied Nuclear Physics Series)
by Yuri M Tsipenyuk
Institute of Physics : Bristol–Philadelphia, 1997
xii + 454 pages, illustrated; price : $ 180.00 (Hard cover); ISBN 0–7503–0422–7

The book under review is based on the lectures on quantum physics and applied nuclear physics that the author gave to the students at the Moscow Institute of Physics and Technology.

The book aims to provide 'scientists and engineers representing various interest groups and professions with a clear understanding of the basic principles and potentials of nuclear physics'. To achieve this goal, the author presents in the first five sections a very lucid account of the basic theory and models and the experimental methods in nuclear physics. The potentials and applications of nuclear physics methods in various branches of non-nuclear sciences and technology are unfolded in the subsequent sections. These include Mössbauer effect, slow neutron physics, potential and modern trends in activation analysis, radiography, nuclear geochronology, channelling effects, nuclear microprobes, tomography, the use of short-lived isotopes in clinical diagnosis, nuclear physics in ecology and agriculture. Each section is followed by an extensive list of references and a bibliography to guide readers to general texts and detailed discourse on specific topics of interest.

The wonderful world of applications of nuclear physics methods unfolds before the eyes as one delves through the book, and in the opinion of the present reviewer, the book will be of immense interest and value to inquisitive graduate students and researchers, and to practising engineers and scientists in various branches of research and applications where nuclear physics methods are used and have great potentials.

H BANERJEE
S N Bose National Centre for Basic Sciences
Salt Lake, Calcutta-700 091

High Temperature Superconductivity—Ten Years after its Discovery

(Proceedings of the International Workshop held at the University of Rajasthan, Jaipur, India, 1996)

edited by K B Garg and S M Bose

Narosa Publishing House : New Delhi–Madras–Bombay–Calcutta–London, 1998

264 pages, illustrations; ISBN 81–7319–155–7

"High Temperature Superconductivity—Ten Years After its Discovery" edited by K B Garg (University of Rajasthan) and S M Bose (Drexel University) is a 1998 publication based on 23 invited talks and 39 other presentations in their 1996 International Workshop in Jaipur, Rajasthan, India. These 39 presentations in the book have been printed under eight headings. To indicate the contents of the whole book, followings are the headings and the number of invited talks and other papers against each heading : [A] Bulk Materials Synthesis and Characterization (3+10), [B] Transport Properties : Thermal and Electrical (1+2), [C] Theoretical Models (7+8), [D] Electronic Structure (4+6), [E] Band Gap and Symmetry of Order Parameter (2+1), [F] Magnetism and Critical Current (2+3), [G] Thin Films : Synthesis and Characterization (2+7) and [H] Applications (2+2). Such classification is obviously not unique. The paper on planar and curved YBCO films by Freyhardt *et al,* presently classified under [F], can be alternatively put under [H], or the paper on Harmonics generation in films by Shrivastava *et al* can shift from [F] to [G], for example.

The expressed openness of the workshop-organizers to accommodate widest possible range of topics and even opposing viewpoints, reflects the actual state of affairs in the field of high temperature superconductors. But it also makes a concise review of the book very difficult.

Section [A] on synthesis and characterization, longest among the sections on experimental efforts, include latest work on Hg-cuprates, Mössbauer investigations, stripe formation (Goodenough and Zhou), high pressure and radiation damage effects and substitutional studies. A large number of papers on X-ray Absorbtion Fine Structure, XAFS, including an introduction type review by Gurman and Amiss make Electronic Structure or section [D] very informative. However, XANES probing of electronic structure as well as local atomic structure studies by EXAFS have been covered. It also has a paper (Mitra *et al*) analyzing the Raman scattering results in alkali-doped fullerides. Confusion over the symmetry of order parameter in HTSC has been treated nicely in two papers in section [E]. Determination of the superconducting gap structure by STM/STS and dependence of these tunnelling features on the details of the terminating layer of the superconductor have been investigated by Sugawara *et al.*

In section [F], magnetic susceptibility of Sn-added (Tl, Pb)-1223 and of Bi-2212 with Ca partially and fully substituted by Gd have been reported by groups from Colorado

and Hyderabad, respectively, observing about 10 fold increase of critical current density in Sn-added (Tl, Pb)-1223. Vortex viscosity and phase transition in Y-123 single crystals have been studied by a novel ultrasonic technique in Milwaukee by Dasgupta *et al.* In section [G], Y-123/Dy-123 and (Hg, Tl)-1223/(Hg, Pb)-1223 film deposition by various methods like MBE (S K Gupta), spray pyrolysis, MOCVD, various sputtering processes and pulsed laser ablation have been outlined. The experiments by R P Gupta *et al* on grain boundary based superconducting-FET have implications for application of HTSC in electronics.

There are more papers in the theory section, section [C], than in any other section. Starting with "HTSC : Facts and Theories" by T V Ramakrishnan, one can have a wide view of the van Hove scenario (about 5 papers), a glimpse of the interplay of band *J-T* effect and superconductivity (2 papers from the same group) and a feel (through 2 papers by a Drexel-Liege collaboration) of the effects in layered superconductors of the collective modes or plasmons and of the Hubbard exchange correlation. An anisotropic (momentum-dependent) impurity scattering by these anisotropic superconductors has been considered by a Waterloo group. With respect to superfluidity in ^{4}He, Y S Jain has worked out a microscopic theory of interacting bosons and R N Silver has linked superfluidity, Bose condensation and neutron scattering in liquid ^{4}He.

2 papers on degradation of 123 superconductivity by water and its recovery by heat treatments, as studied by a Delhi group, have been included under the heading Applications, section [H]. Most interesting entries in this section, however, are on development of conventional superconducting magnet system (R G Sharma) and on development of ceramic superconductors for electric power applications (U Balachandran).

The above summary shows a wide coverage of the multi-directional progress made in HTSC since its discovery in 1986. There are fewer papers on HTSC wires and cables, IR and other applications and on investigations of HTSC by newer nuclear techniques, topics covered well in a few regular conferences. This is inevitable in a book of 437 pages. The value of the book lies in what it contains. Most of the reviews are of high quality. Consulting its collection of papers on a particular topic and/or the review will save the reader a lot of literature search. So, libraries, unable to keep all superconductivity-related journals, can try this moderately priced book. The editing and typing are of highest standard. As a guide to present day findings and future directions, this book should be useful to beginners and advanced researches in the field.

UDAYAN DE
VEC Centre,
Calcutta-700 064